

Appl. No. 10/734,708
Reply to Office action of 10/20/2005

REMARKS

Reconsideration of the above-referenced application in view of the above amendment, and of the following remarks, is respectfully requested.

Claims 1, 4-9, 22-27, 44-50, and 52-66 are pending in this case. Claims 1, 4, 9, 22, 26, 44, 52, and 66 are amended herein and claims 2, 3, 10-13, 33-43, and 51 are cancelled herein. Claims 14-21 and 28-32 stand withdrawn.

The Examiner rejected claims 1-13, 22-27, 33-57, and 63-66 under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1 and 26 are amended and claim 33 cancelled to overcome the rejection. Claim 1 is amended to (1) clarify that the same gate electrode is referred to in the recited steps, (2) change "high-k dielectric" to "high-k gate dielectric layer" through-out the claim, and (3) clarify that the first anneal refers to step 62 and the second anneal refers to step 84. Claim 26 is amended to change "high-k dielectric layer" to "high-k gate dielectric layer". Accordingly, Applicant respectfully requests that this rejection now be withdrawn.

The Examiner rejected claims 1-2, 22-26, 65 and 66 under 35 U.S.C. 102(e) as being anticipated by Colombo et al. (U.S. Patent 6,809,370).

Applicant respectfully submits that amended claim 1 is unanticipated by Colombo as there is no disclosure or suggestion in the reference of performing a first anneal of the deposited high-k gate dielectric layer in a non-oxidizing ambient prior to nitriding the deposited high-k gate dielectric layer and performing a second anneal of the deposited high-k gate dielectric layer in an oxidizing ambient prior to forming the gate electrode and after nitriding the high-k gate dielectric layer. Colombo teaches dual anneals performed after nitridation rather than a non-oxidizing before and an oxidizing

Appl. No. 10/734,708
Reply to Office action of 10/20/2005

after as required by the claim. Accordingly, Applicant respectfully submits that claim 1 and the claims dependent thereon are unanticipated by Colombo.

Applicant respectfully submits that claim 66 is similarly unanticipated by Colombo.

The Examiner rejected claims 1, 63-65 and 66 under 35 U.S.C. 102(e) as being anticipated by Jung et al. (U.S. Patent 6,875,678).

Applicant respectfully submits that amended claim 1 is unanticipated by Jung et al as there is no disclosure or suggestion in the reference of performing a first anneal of the deposited high-k gate dielectric layer in a non-oxidizing ambient prior to nitriding the deposited high-k gate dielectric layer and performing a second anneal of the deposited high-k gate dielectric layer in an oxidizing ambient prior to forming the gate electrode and after nitriding the high-k gate dielectric layer. Jung teaches nitridation followed by oxidation and/or anneal. An anneal prior to nitridation is not taught. Accordingly, Applicant respectfully submits that claim 1 and the claims dependent thereon are unanticipated by Jung.

Applicant respectfully submits that claim 66 is similarly unanticipated by Jung.

The Examiner rejected claims 1 and 33-51 under 35 U.S.C. § 103(a) as being unpatentable over Jung et al. (U.S. Patent 6,875,678) in view of Visokay et al. (U.S. 2003/0129817).

The instant application and the Visokay (2003/0129817) reference were, at the time the invention was made, owned by, or subject to an obligation of assignment to, the same person. Accordingly, Applicant respectfully requests that the rejection be withdrawn.

Appl. No. 10/734,708
Reply to Office action of 10/20/2005

The Examiner rejected claims 1, 33-57 under 35 U.S.C. § 103(a) as being unpatentable over Colombo et al. (U.S. Patent 6,809,370) in view of Visokay et al. (U.S. 2003/0129817).

In addition to the Visokay reference noted above, the instant application and the Colombo (6,809,370) reference were, at the time the invention was made, owned by, or subject to an obligation of assignment to, the same person. Accordingly, Applicant respectfully requests that the rejection be withdrawn.

The Examiner rejected claims 1-13 under 35 U.S.C. § 103(a) as being unpatentable over Jung et al. (U.S. Patent 6,875,678) in view of Harada (U.S. Patent 6,642,131).

Applicant respectfully submits that amended claim 1 is patentable over Jung in view of Harada as there is no disclosure or suggestion in the references of performing a first anneal of the deposited high-k gate dielectric layer in a non-oxidizing ambient prior to nitriding the deposited high-k gate dielectric layer and performing a second anneal of the deposited high-k gate dielectric layer in an oxidizing ambient prior to forming the gate electrode and after nitriding the high-k gate dielectric layer. Jung teaches nitridation followed by oxidation and/or anneal. An anneal prior to nitridation is not taught. Harada teaches forming a SiON film 21 and an overlying HfO film 22. Harada then teaches annealing to remove hydrogen from the films and promote cross diffusion (Si into the HfO and Hf into the SiON) to improve the thermal stability of the film 25 as a whole (i.e., combined films 21 and 22). While this anneal does occur prior to a nitridation step, it would not be obvious for one of ordinary skill in the art to employ the pre-anneal of Harada in the method of Jung. Harada teaches the anneal to cause an interaction between the two layers. Since the motivation for performing the pre-anneal in Harada does not apply to Jung, one of ordinary skill in the art would not be motivated to modify the method of Jung to include a pre-anneal as taught in Harada. Accordingly, Applicant respectfully submits that claim 1 and the claims dependent thereon are patentable over Jung in view of Harada.

Appl. No. 10/734,708
Reply to Office action of 10/20/2005

The Examiner rejected claims 26-27 and 56-57 under 35 U.S.C. § 103(a) as being unpatentable over Colombo et al. (U.S. Patent 6,809,370) or Colombo et al. (U.S. Patent 6,809,370) in view of Visokay et al. (U.S. 2003/0129817) as applied to claims 22 and 52 above, and further in view of Visokay et al. (U.S. 2003/0045080).

In addition to the Visokay and Colombo references noted above, the instant application and the Visokay (2003/0045080) reference were, at the time the invention was made, owned by, or subject to an obligation of assignment to, the same person. Accordingly, Applicant respectfully requests that the rejection be withdrawn.

In light of the above, Applicant respectfully requests withdrawal of the Examiner's rejections and allowance of claims 1, 4-9, 22-27, 44-50, and 52-66. If the Examiner has any questions or other correspondence regarding this application, Applicant requests that the Examiner contact Applicant's attorney at the below listed telephone number and address.

Respectfully submitted,



Jacqueline J. Garner
Reg. No. 36,144

Texas Instruments Incorporated
P. O. Box 655474, M.S. 3999
Dallas, Texas 75265
Phone: (214) 532-9348
Fax: (972) 917-4418